EXPERIMENTAL PROJECTS CONSTRUCTION REPORT

KWIK BOND 1121 POLYESTER POLYMER CONCRETE (PPC) OVERLAY

Location: Interstate 90/Stillwater County /Billings District: Three Decks Selected: (I00090391+00402) SEP COUNTY ROAD, (I00090400+03661) BERRY CREEK, (I00090400+03662) BERRY CREEK

Project Name: Br Deck Rehab/Repair 11

Project Number: BH STWD (043) - CN 6837000

Experimental Project: MT-13-05

Type of Project: Bridge Deck Rehabilitation

Principal Investigator: Craig Abernathy: Experimental Project Manager (ExPM)

Technical Contact: Jeff Olsen, Bridge Bureau; Billings District

Contractor: Meyers and Sons Construction

Description

This project is a bridge deck rehabilitation system using an engineered composite polyester polymer concrete overlay system that (per manufacturer's information) can rehabilitate ride defects; seal out moisture, oxygen and chloride ions from permeating into the deck; and return traffic in two hours (based on thickness of overlay) at temperatures down to 40°F.

Experimental Design

The Kwik Bond 1121 Polyester Polymer Concrete (PPC) overlay was applied on three (3) designated bridge decks for the purpose of extending the life of the deck and restoring skid integrity. Overlay thickness was on average measured at 1.25" (3.2 cm). A High Molecular Weight Methacrylate (HMWM) sealer was applied to the deck surface prior to the overlay application.
Evaluation Procedures

Construction Documentation: Will include information specific to the installation events of the HMWM sealer and PPC overlay.

Post Documentation: Will entail periodic site visits/inspections of PPC overlays for inclusion into the annual and final reports; in addition, documentation will include any maintenance activities associated with the overlays.

Evaluation Schedule

Research will monitor and report on performance for a minimum period of five years annually. This is in accordance with the Department’s “Experimental Project Procedures”. Delivery of a construction/installation report, interim, annual or semi-annual reports is required as well as a final project report (responsibility of Research). A web page will be dedicated to display all reporting from the project.

2014: Installation/Construction Report
2015-2018: Semi-Annual Inspections/Annual Evaluation Reports
2019: Final Evaluation/Final Report

Project Information

MDT project staff stated the installation of the Kwik Bond PPC overlays followed the manufacturer’s guidelines and that no construction issues were noted that may affect future performance. A Kwik Bond representative was present on site.

The PPC overlay began applications at approximately 1:30 AM. The ambient air temperature was 65° F, wind speed at 2-3 mph, relative humidity at 42%, and the deck temperature was approximately 68° F. Project began the week of August 18.

The process of paving is to perform one paving pass, relocate the slip form paver to the other prepared deck, and perform another pass which allows the previous PPC application to cure (average 3-4 hours), then move back to the original deck and proceed with another pass. Repeating this process until the decks receive the full PPC treatment.

The three decks will be monitored for wear and pavement condition for a minimum of five years. If the wear readings do not show rapid deterioration of the PPC, the five year term may be extended. If the monitoring time frame is protracted, the final report will be issued when the MDT is satisfied that the performances of the structures have been quantified.

The following section of the report represents the general examples of the application practice involved with the Berry Creek eastbound structure.
Although difficult to see in this image, deck preparations consist of shot blasting, hand grinding of pavement markers, air blasting, deck sweeping, and solvent spot cleaning of oil and stains.

Proper deck preparation is a critical element in the PPC process.

A specialized mobile mixing unit is used for the PPC treatments. It contains the storage bins for the blend of aggregates to be used, the polyester polymer storage tank (unsaturated polyester resin in styrene), and the PPC screw auger.

The paving unit is an Allen High Profile Two Track Polyester Slip Form specifically designed for PPC paving applications.
During active operation, the aggregates (red arrow), are conveyed to the mixing chute (blue arrow); the styrene is injected into the aggregate blend by a fixed nozzle (white arrow).

The styrene infused aggregates are then transported through a mixing auger screw/chute (yellow arrow) to be deposited into the paver hopper.
Prior to the paving of the overlay, high molecular weight methacrylate (HMWM) is added to the prepared surface as a prime sealing coat.

At the beginning of the paving runs.

Note the paver initially tines the PPC as it exits out the rear of the slip form.

Based on a projects requirement, a PPC overlay may vary from 3/4" to 12" in thickness.

The PPC is screed and floated to the desired density and texture.
Another image showing the workman applying a float to the PPC.

Longitudinal tining is reapplied for mechanical texture as one of the last steps in completing the PPC run.

However prior to tining, a layer of top sand (quartzite) is hand applied to the surface of the overlay to provide added skid resistance.

Close-up of the Kwik Bond top sand.
Completed PPC run with approach and edges feathered.

Close-up of tined surface with top sand application.

Additional close-up of aggregate texture with added top sand prior to tining.

The Material Safety Data Sheet (MSDS) lists the types of aggregates as follows: EC Sand, EC Rock, Top Sand, A-3083 Rock, B-70 Fine Sand, B-11 Sand, B-39 Gravel, MLS Friction Aggregate, and Blend 84. All in the chemical family of Silicon Dioxide.
Berry Creek Structure – Westbound: View west.

Berry Creek Structure – Eastbound: View west.
A smooth transition was obtained by rebuilding the approaches.
Sep County Rd. structure: View of cracking along an expansion joint on the south side, east end of the westbound deck.

Close-up of PPC texture in wheel path.
Cross section close-up of the aggregate matrix in the fully cured polyester polymer overlay: Thickness represented in this image is approximately 1.25” (3.2cm).

VIDEO: The following is a short clip of the PPC paving process:
http://youtu.be/Evn2_kWx7ZQ

This report and other project information is available at:
Disclaimer

The use of a product and/or procedure in the course of an evaluation does not constitute an endorsement by the MDT nor does it imply a commitment to purchase, recommend, or specify the product in the future.

Data resulting from an evaluation of a submitted product or procedure is public information and will not be considered privileged. The MDT may, at its discretion, release all information developed during the product evaluation.